GENERAL INSTRUCTIONS
INTER
NATIONAL
LIGHT

463

901257

inter national light

DEXTER INDUSTRIAL GREEN, NEWBURYPORT, MASS. 01950 465-5923

MP MASTER
MA28468

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GENERAL INSTRUCTIONS

IL463 MULTICHANNEL UNIFORMITY RADIOMETER

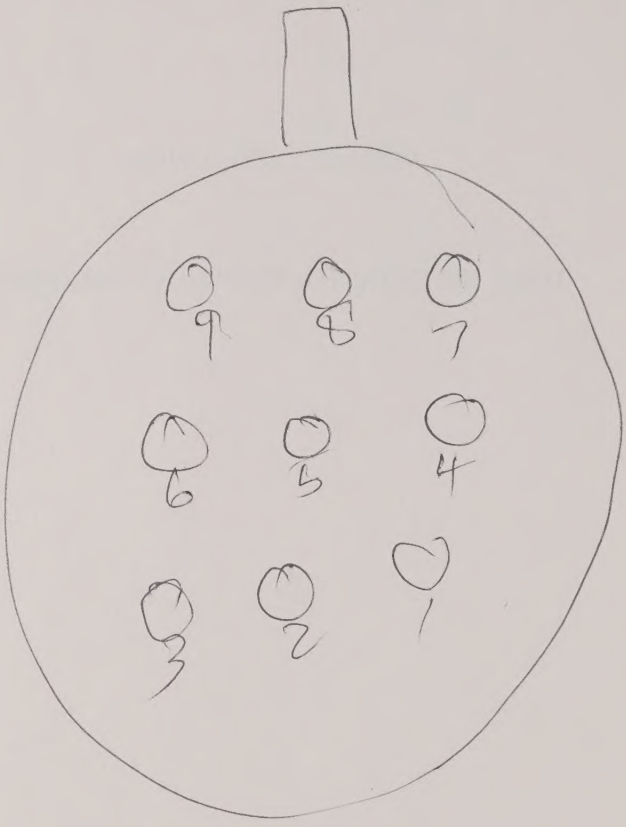
INTERNATIONAL LIGHT, INC.
DEXTER INDUSTRIAL GREEN
NEWBURYPORT, MASSACHUSETTS 01950
(617) 465-5923

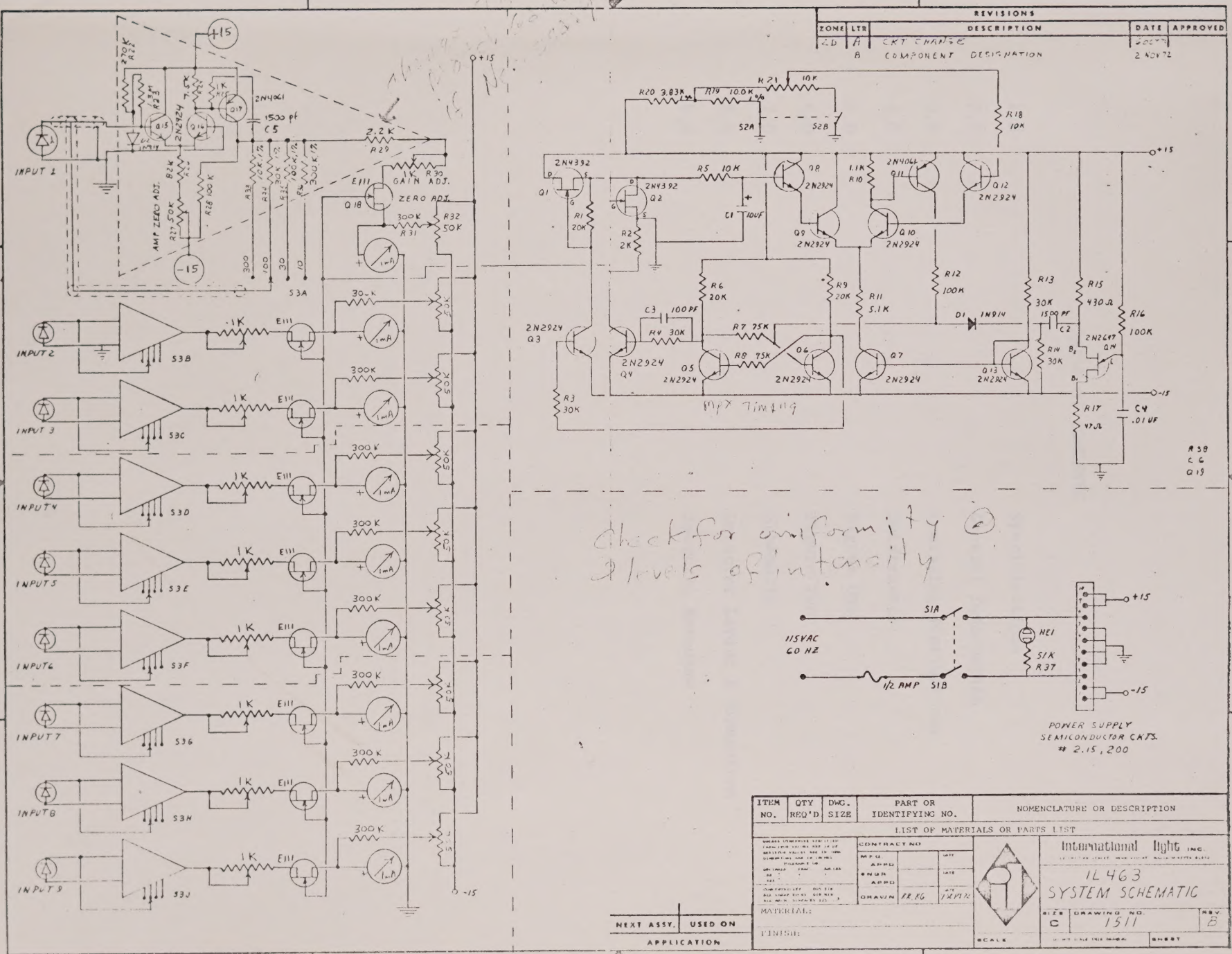
Damond Rock - Mt. Cama
No Charge

Sensor cable plug to Instrument

SN 112

A – R/Bk – 1
B – Or/Bk – 2
C – Gn/Bk – 3
D – Or – 4
E – Gn – 5
F – R – 6
H – Bu – 7
J – W – 8
k – W/Bk – 9
N – Bk – 2 com
Sh? –




REVISIONS
ZONE | LTR | DESCRIPTION | DATE | APPROVED
2D | A | CKT CHANGE | 2 NOV 72
B | COMPONENT DESIGNATION
+15
-15
INPUT 1
INPUT 2
INPUT 3
INPUT 4
INPUT 5
INPUT 6
INPUT 7
INPUT 8
INPUT 9
AMP ZERO ADJ.
ZERO ADJ.
GAIN ADJ.
2N4061
2N2924
2N4392
1500 pf
S3A
S3B
S3C
S3D
S3E
S3F
S3G
S3H
S3J
MPX TIMING
POWER SUPPLY
SEMICONDUCTOR CKTS.
2.15,200
check for uniformity @
3 levels of intensity
115VAC
60 HZ
1/2 AMP SIB
S1A
S1B
HEI
51K
R37
ITEM NO. | QTY REQ'D | DWG. SIZE | PART OR IDENTIFYING NO. | NOMENCLATURE OR DESCRIPTION
LIST OF MATERIALS OR PARTS LIST
CONTRACT NO
MFG
APPD
ENGR
APPD
DRAWN
MATERIAL:
FINISH:
NEXT ASSY.
USED ON
APPLICATION
SCALE
International light INC.
IL463
SYSTEM SCHEMATIC
SIZE C
DRAWING NO. 1511
REV B
SHEET

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1.0 SPECIFICATIONS

1.1 MEASUREMENT RANGE AND ACCURACY - Nominal unit design designates a range of 3 mW/cm^2 to 300mW/cm^2. Electrical linearity $\pm$ 1%. Detector cells matched to within $\pm$ 1%.

1.2 INPUT - Four ranges: 10, 30, 100 and 300. Absolute irradiance units (mW/cm^2) are designated by a calibration factor supplied with the unit and detector.

1.3 MASTER GAIN CONTROL - Expands sensitivity of all channels to a maximum of three to one. The control clicks into a calibration position when not in use and can be locked at any setting.

1.4 AMPLIFICATION - Nine separate operational amplifiers: one for each channel.

1.5 METERS - Nine edgewise vertically mounted panel meters.

1.6 ENVIRONMENTAL TOLERANCES -

15° - 35° Centigrade

10% - 90% Humidity

0 - 10,000 Feet altitude

1.7 POWER REQUIREMENTS - 120 VAC (240 VAC supplied only on specific request), 50 - 60 Hz, 60 watts maximum.

1.8 DIMENSIONS - 11"W x 5"H x 7"D (approximate)

1.9 WEIGHT - 12 lbs. (approximate)

INTERNATIONAL LIGHT, INC.
DEXTER INDUSTRIAL GREEN
NEWBURYPORT, MASSACHUSETTS 01950

IL463 MULTICHANNEL UNIFORMITY RADIOMETER
STANDARD PHOTORESIST CALIBRATION

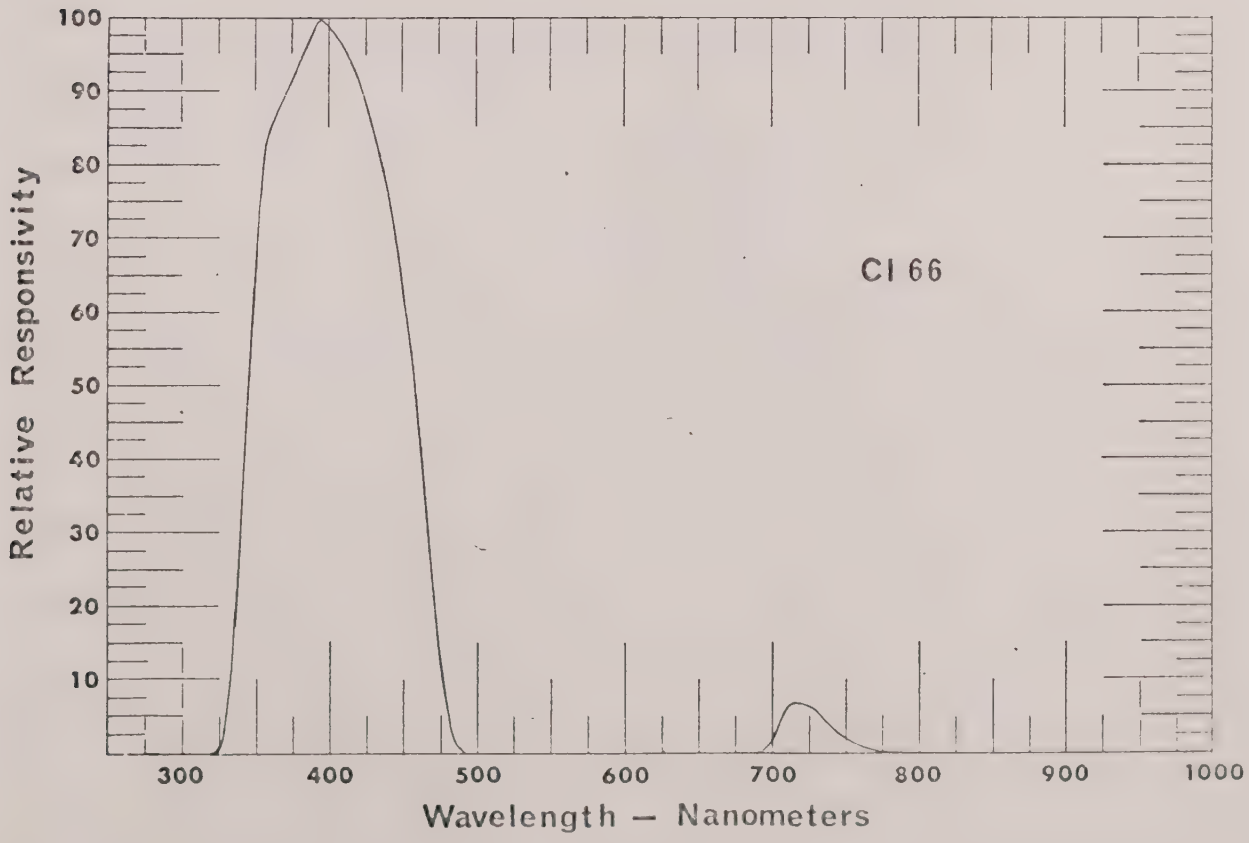
DATE 7 November 1974

RENDERED TO: Harris Semiconductor

CERTIFICATE #: 41107402 F.O.#: 6075

DETECTOR/UNIT SERIAL #: CI 66 #92

CALIBRATION: 2.02 mW/cm^2/scale unit



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2.0 GENERAL INFORMATION

2.1 The initial internal adjustments for each separate channel are preset at the factory so that the operator is required to make adjustments on only two control functions in order to determine the uniformity of the source being measured. The control functions are the input range switch and the master gain control. The input range switch is the four position switch used to bring the input readings of all nine channels to a working range for proper uniformity readings and/or adjustments of the source. The master gain control, controls the sensitivity, permitting the operator to increase the gain of all channels uniformly from one (1) to three (3) times that of the original input readings. This is done so that a full scale reading may be obtained over the full instrument sensitivity range.

3.0 OPERATING INSTRUCTIONS

3.1 RELATIVE UNIFORMITY - To read the relative uniformity of the source, follow this simple step by step procedure:

1. Turn the power on, on the IL463. The toggle switch in the lower left corner of the unit.
2. Place the detector plate in the substrate exposure field.
3. Connect the cable from the detector into the back of the appropriate IL463.

NOTE: DETECTORS AND RADIOMETERS ARE NOT INTERCHANGEABLE

Each detector and it's appropriate radiometer is stamped with the same serial number. The detector and radiometer are calibrated as one unit. Interchanging of radiometers and detectors will result in erroneous readings due to variations in the sensitivity of the cells and the transmission of the filters in the detector plate.

4. Turn the source to be measured on and allow it to stabilize. Adjust the input range switch to give you a working reading of at least 30% (.30) full scale.
5. Turn the master gain knob clockwise out of the cal position and continue turning until the average meter indication is 90% (.90) of full scale. See figure 1B. For a perfectly uniform source, all the panel meters should read 90% (.90) as shown in figure 1A. If the source is not uniform, it will then be necessary to make the appropriate adjustments of the source to bring it up to optimum uniformity.

6. Once the source has been adjusted to within close proximity of uniformity it is possible to gain additional sensitivity from the radiometer by turning the master gain control up to give a reading of 100% (1.00) full scale allowing even closer adjustment of the source.

3.2 ABSOLUTE UNIFORMITY - Once the source has been adjusted to indicate optimum uniformity, the absolute reading may be found by returning the master gain control knob back to the cal position and by applying the following expression.

ABSOLUTE IRRADIANCE = SCALE READING X INPUT RANGE X CAL FACTOR

3.3 EXAMPLE - Assume we have an average meter reading of 35% (.35) full scale on the 100 input range. The master gain control is adjusted to obtain an average reading of 90% (.90) full scale and the source is adjusted to give a uniform reading of 90% (.90) on all the meters. The master gain is then adjusted to 100% (1.00) full scale for the extra sensitivity and the uniformity is rechecked.

After completing the final touch-up adjustments the master gain control is returned to the cal position indicating a reading of 35% (.35) full scale on all meters. Assuming that the calibration factor for the unit used in 1.290 mW/cm^2/scale unit and substituting the information just obtained into the formula given above we get the following results:

$$\text{ABSOLUTE IRRADIANCE} = .35 \times 100 \text{ scale units} \times 1.290 \frac{mW}{\text{scale units} \times cm^2}$$

$$\text{ABSOLUTE IRRADIANCE} = 45.15\ mW/cm^2$$

Also in the same manner, if the input range is 300 and the scale reading is .45, the absolute irradiance reading would be as follows:

ABSOLUTE IRRADIANCE = .45 x 300 scale units x 1.290 mW/cm^2/scale units

ABSOLUTE IRRADIANCE = 174.15 mW/cm^2

MAINTENANCE

4.1 Little or no maintenance should be required after initial factory calibration. Interchanging of boards or internal repairs of boards will, in most cases, render the calibration of the unit invalid. In the same manner repositioning and/or replacement of the two filters in the detector plate will render the calibration invalid.

4.2 To clean the exterior shell and meter fronts, use a mild solution of soap and water or window cleaner. To remove grease or oil use Kerosene sparingly. DO NOT use acetone, benzene, carbon tetrachloride, fire-extinguishers fluids, lacquer thinners, or window cleaners containing these solvents since they will smear or soften the meter fronts.

4.3 In the event it ever becomes necessary to make adjustments, repairs, or parts replacements in the unit, the following alignment procedures should be followed.

The simplest and least time consuming method for re-aligning the system is to transfer the calibration from a second functional unit through the use of the exposing source. STEP ONE - After making the necessary repairs to the unit, plug the detector into the back of the radiometer and shield the detector plate from light. The detectors are not very sensitive to room light so it should only be necessary, in most cases, to tip the detector upside down on the bench. STEP TWO - (internal zero) Turn the input range switch to the 10 scale. Now rotate the master gain control back and forth from one end to the other, noting any movement of the meters. Continue rotating the master gain control back and forth adjusting the internal zero adjust (IZ) of the Appropriate channels as indicated by figure # 2. Repeat the process with all channels until no movement of the meters is evident.

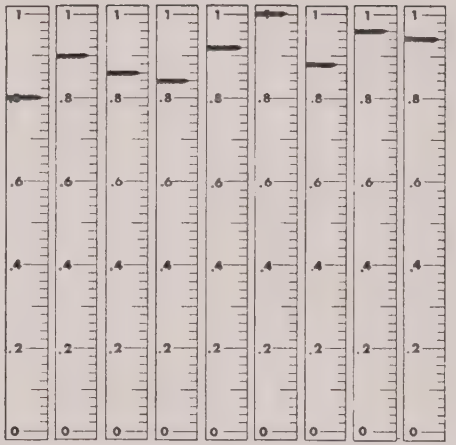
STEP THREE - (meter zero adjustment) With the detector plate still face down on the bench, adjust the meter zero pots for each channel as indicated by figure # 2 until all meters read zero.

STEP FOUR - (gain adjust METHOD ONE) It is possible to transfer the calibration of a working unit to the unit repaired by using the substrate exposing source. This is done by placing a calibrated working unit under the source and noting the meter indication for each channel. Replace the calibrated unit with the uncalibrated detector making sure that the individual detectors correspond to the location of the previous detectors. Now simply adjust each channel to read the same as the calibrated unit. In this method the absolute calibration can be transfered by using simple mathematics. STEP FOUR - (gain adjust METHOD TWO) In most cases this method will have to be used due the absence of a second unit to calibrate by. Method two takes a little longer, requires more precision and may be less accurate depending on technique. The source should be current regulated and of course powerful enough to render a good meter indication on the unit. Place each detector port, one at a time, in the same source location and adjust the gain to read the same on each meter. Extreme care should be used in moving each detector to the same spot under the light source. Irregularities in centering the source could result in a poor calibration. With this method there is no way of determining an absolute irradiance calibration factor, which must be ascertained in a fully equipped radiometric calibration laboratory. It is recommended that the gain for channel five (5) be left untouched by adjusting all other channels to establish the proper uniformity. In this way the original cal factor will probably remain valid.

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

figure 1

A



B

ITEM NO.	QTY REQ'D	DWG. SIZE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION
			LIST OF MATERIALS OR PARTS LIST	

CONTRACT NO

MFG APPO

ENGR APPO

DRAWN

MATERIAL:

FINISH:

NEXT ASSY. | USED ON

APPLICATION

SCALE

International light INC.

IL 463

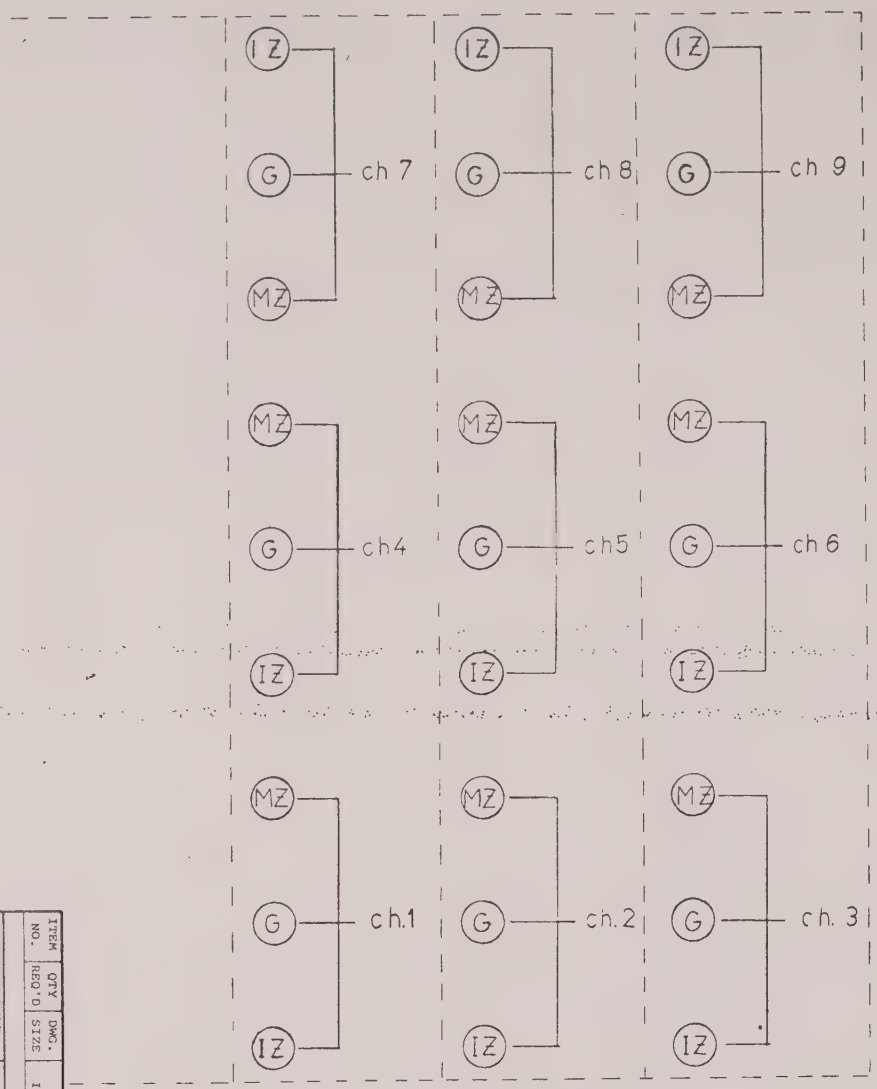
EDGEWISE PANEL METERS

SIZE C | DRAWING NO. 1555 | REV

SHEET

4 3 2

figure 2



pc boards – front top view

G – gain adjust

MZ – meter zero adjust

IZ – internal zero adjust

NEXT ASSY | USED ON

APPLICATION

ITEM NO. | QTY REQ'D | DWG. SIZE | PART OR IDENTIFYING NO. | NOMENCLATURE OR DESCRIPTION

LIST OF MATERIALS OR PARTS LIST

CONTRACT NO

DRAWN

SCALE

International lights INC.

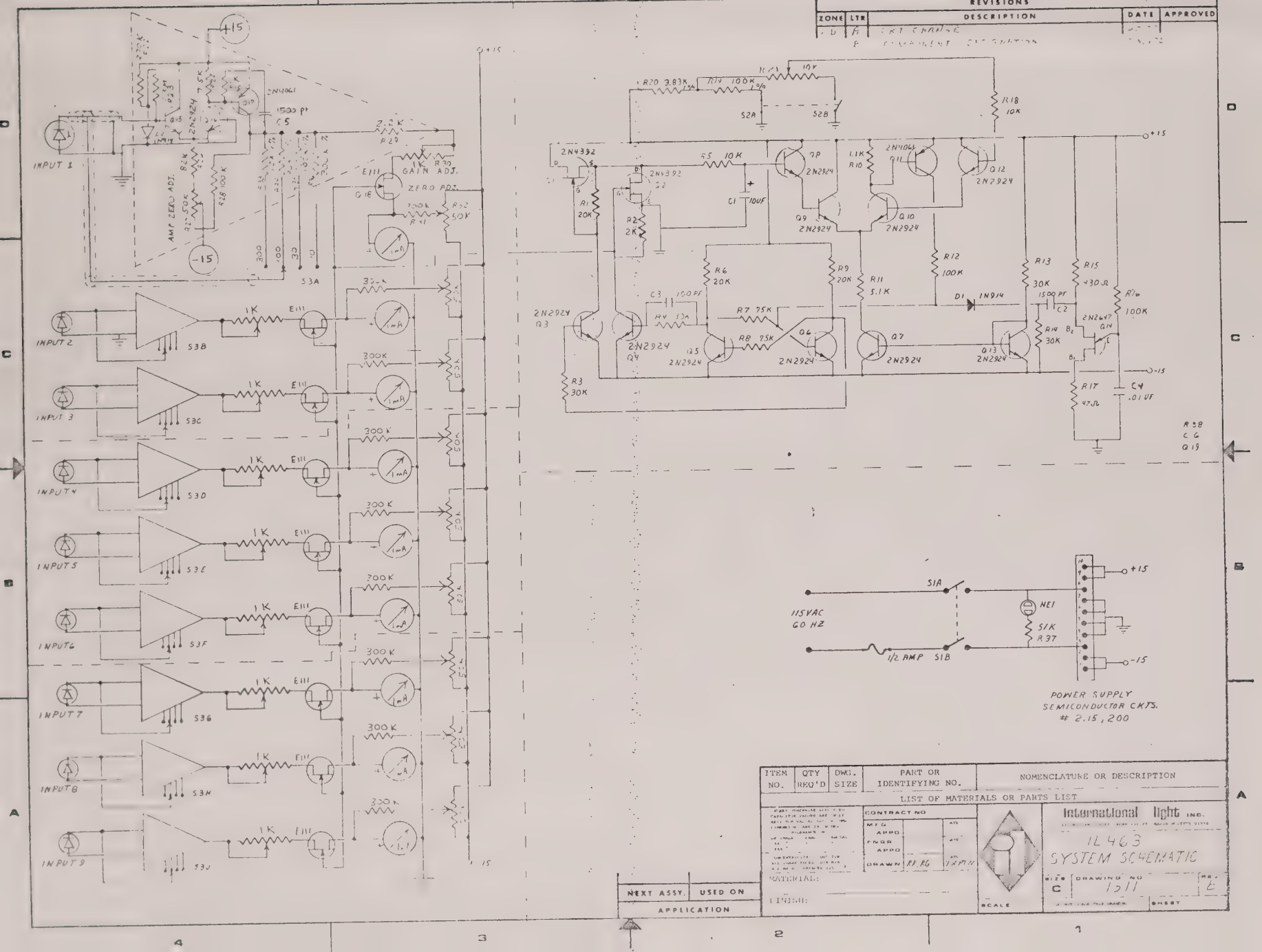
IL 463 ADJUSTMENT POT. LOCATIONS

SIZE C | DRAWING NO 75118 | REV

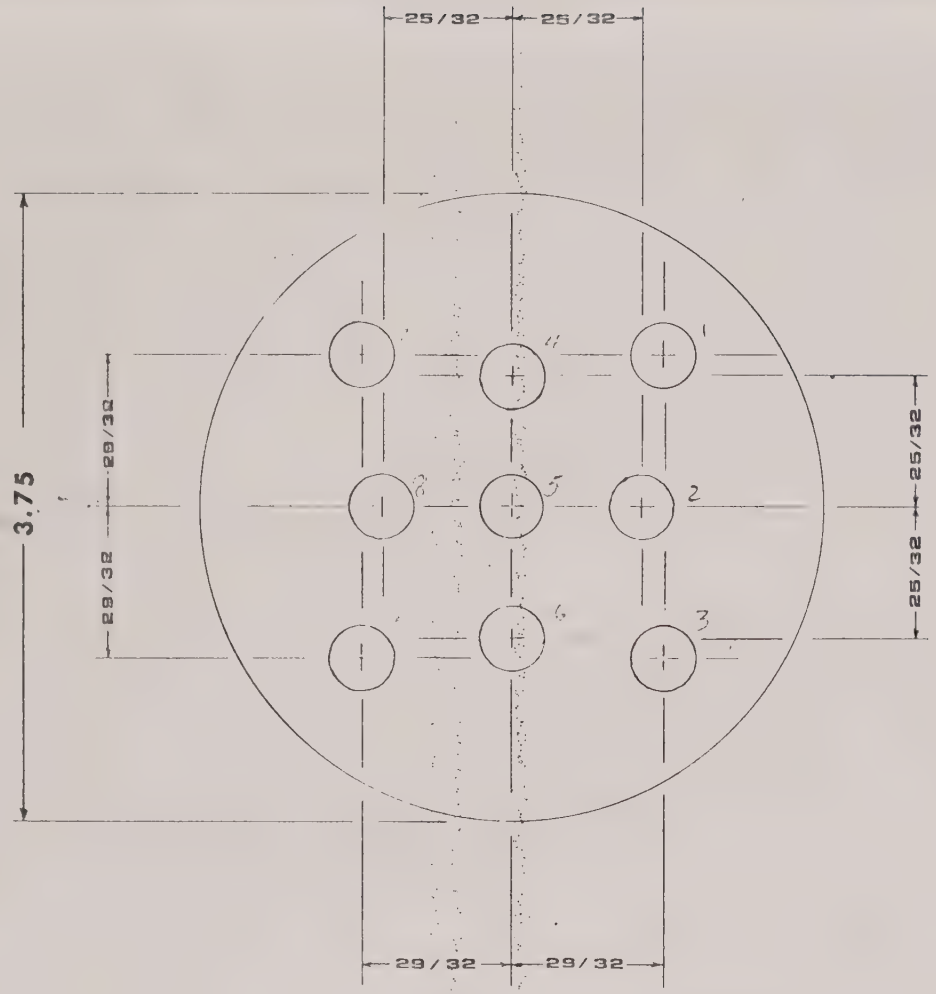
SHEET

REVISIONS

ZONE | LTR | DESCRIPTION | DATE | APPROVED


REVISIONS
ZONE | LTR | DESCRIPTION | DATE | APPROVED
INPUT 1
INPUT 2
INPUT 3
INPUT 4
INPUT 5
INPUT 6
INPUT 7
INPUT 8
INPUT 9
AMP ZERO ADJ.
ZERO ADJ.
GAIN ADJ.
+15
-15
2N4061
2N2924
1500 pf
1K
1mA
300K
50K
S3A
S3B
S3C
S3D
S3E
S3F
S3G
S3H
S3J
R20 3.83K
R19 100K 1%
R21 10K
S2A
S2B
R18 10K
2N4392
R1 20K
R2 2K
C1 10UF
R5 10K
Q8 2N2924
Q9 2N2924
Q10 2N2924
Q11 1.1K R10
Q12 2N2924
R6 20K
R9 20K
R11 5.1K
R12 100K
R13 30K
R15 430 Ω
R16 100K
C3 100 PF
R4 33K
R7 75K
R8 75K
Q3 2N2924
Q4 2N2924
Q5 2N2924
Q6 2N2924
Q7 2N2924
Q13 2N2924
D1 1N914
1500 PF C2
R14 30K
2N2647 Q14
R17 47Ω
C4 .01 UF
R3 30K
R38
C6
Q19
S1A
S1B
115VAC 60 HZ
1/2 AMP
NE1
51K R37
POWER SUPPLY SEMICONDUCTOR CKTS. # 2.15,200
ITEM NO. | QTY REQ'D | DWG. SIZE | PART OR IDENTIFYING NO. | NOMENCLATURE OR DESCRIPTION
LIST OF MATERIALS OR PARTS LIST
CONTRACT NO
MFG
APPD
ENGR
APPD
DRAWN RR.RG
MATERIAL:
FINISH:
NEXT ASSY. | USED ON
APPLICATION
SCALE
International light INC.
IL463
SYSTEM SCHEMATIC
SIZE C | DRAWING NO 1511 | REV E
SHEET
4
3
2
1

ZONE	LTR	DESCRIPTION	DATE	APPROVED



Cable

ITEM NO.	QTY REQ'D	DWG. SIZE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION
			LIST OF MATERIALS OR PARTS LIST	

CONTRACT NO

MFG. APPD ENGR APPD DRAWN

MATERIAL:

FINISH:

NEXT ASSY | USED ON

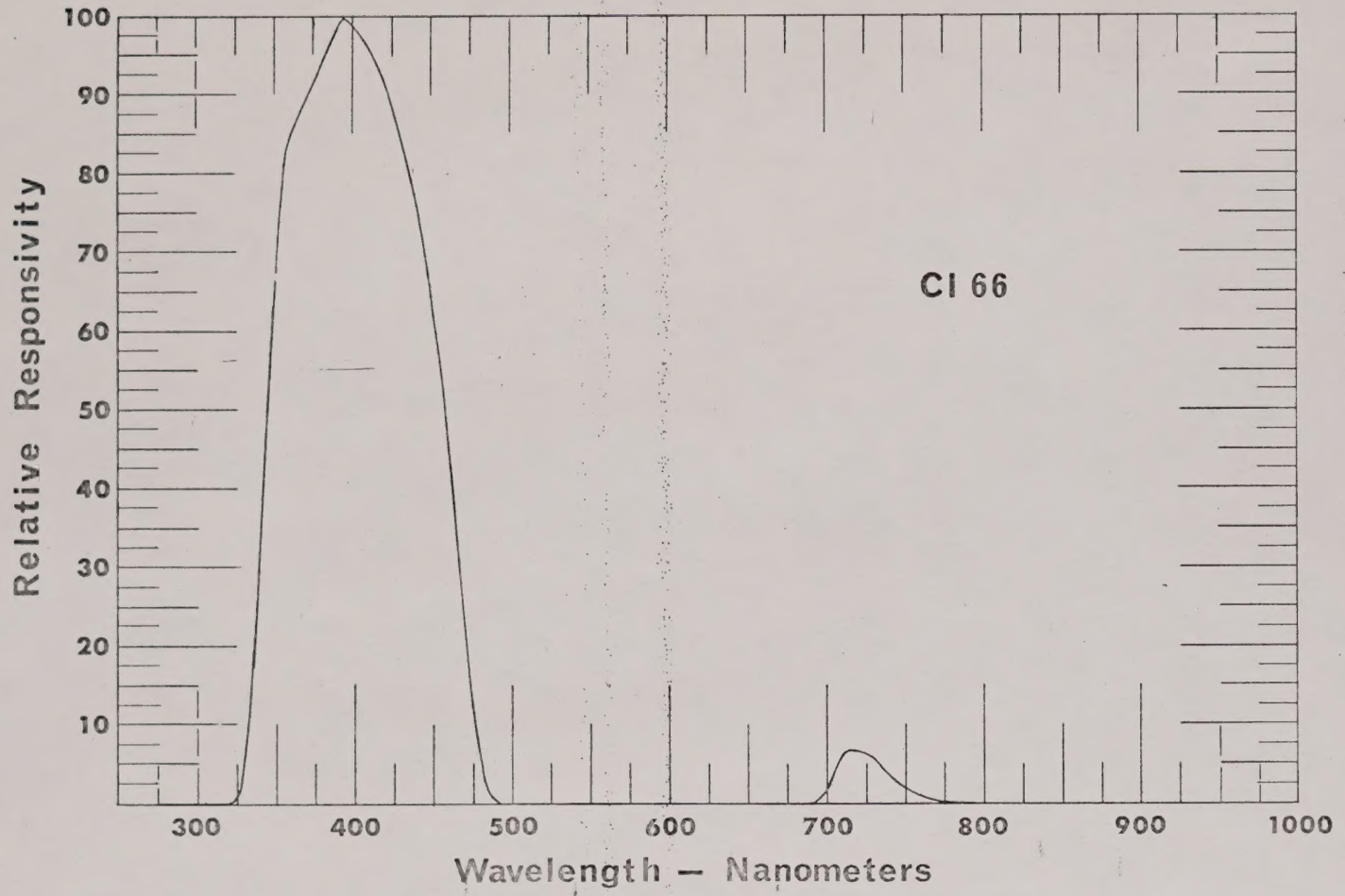
APPLICATION

International light INC.

SIZE C | DRAWING NO | REV

SCALE | SHEET

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED



ITEM NO.	QTY REQ'D	DWG. SIZE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION
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UNLESS OTHERWISE SPECIFIED CAPACITOR VALUES ARE IN μF, RESISTOR VALUES ARE IN OHMS, DIMENSIONS ARE IN INCHES, TOLERANCE ON: DECIMALS XX ± .1, FRACTIONS ±1/64, ANGLES XX °, ELECTRICITY 105 VAC ALL SHARP EDGES .010 MAX, ALL MACH. SURFACES 125

CONTRACT NO		
MFG. APPD		DATE
ENGR APPD		DATE
DRAWN	RB Yoon	DATE 10.10.73

MATERIAL:

FINISH:

NEXT ASSY.	USED ON
APPLICATION	

International light INC.
22 INDUSTRIAL STREET NEWBURYPORT MASSACHUSETTS 01950

RELATIVE RESONSIVITY
CI 66

SIZE	DRAWING NO.	REV.
C	1557	

SCALE — DO NOT SCALE THIS DRAWING — SHEET

MP MASTER
MA28468